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CENTRAL INTELLIGENCE AGENCY

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COUNTRY North Korea

REPORT

SUBJECT Transportation Science Research
Station, Ministry of Transportation.

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*RE (a review of research in the transportation
field carried on at the station; salary of
the govt workers)*

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History:

1. The Ministry of Transportation established in 1956 the Central Research Station under its jurisdiction to solve various technical problems arising in the transportation field. The research station occupied a two-story building of the P'yongyang Railroad Factory, at N 39-02, E 125-44 (YD 354248) in Nanryo-dong, Sosong-guyok, P'yongyang-si. 50X1-HUM
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the Wonsan Branch of the research station was newly established in accordance with a Cabinet decision demanding further effective operation of all research organizations through direct access to respective work sites. The Wonsan Branch took over the three laboratories from the central research station in P'yongyang. 50X1-HUM
the Central Research Station was renamed as the Transportation Science Research Station.

Realm of Transportation Science Research:

2. The work of the Transportation Science Research Station (TSRS) was not directly involved in the 7-year economic plan. The station was charged to help improve various transportation facilities through its researches on the following subjects:
 - A. Introduction of advanced scientific transportation techniques.
 - B. Improvement of techniques and equipment in the transportation field.
 - C. Increase of railroad haulage.
 - D. To save oil, coal, electricity, iron and mafic metals used in the transportation field.
 - E. To electrify all trunk lines.
 - F. To mechanize loading and unloading operations which have been done with manual labor. It was expected that for the time being the TSRS would not participate in construction projects, planning or designing works in the field of transportation.

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Skill of Research Workers:

3. All the research workers in the TSRS consisted of those who received technical education higher than professional school; About 20 percent of them were engineers who had studied abroad, about 40 percent were graduates of North Korean colleges, and the remaining 40 percent were those who graduated from special courses of colleges abroad or from professional schools in North Korea. About 40 percent of the entire research workers consisted of those who had long been college teachers

[] In this respect, the level of the research workers was 50X1-HUM

considered to be very high, and at the present stage the scientific research work performed by the TSRS was satisfactory. [] the 50X1-HUM
TSRS gained little achievements in its scientific research work. []

[] the research activities of the TSRS became active and much 50X1-HUM
successful results have also been obtained thereof.

Research Activities:

4. All the research activities were conducted in accordance with the instructions of the Transportation Minister, and the TSRS closely cooperated with the Technical Bureau of the Transportation Ministry, although it was not administratively controlled by the bureau. All research subjects were first instructed to the chief of the TSRS, who assigned them to respective laboratories via the Science Deputy chief in accordance with categories of research subjects. Receiving a research subject from higher echelon, the laboratory chief assigned a senior research specialist for the subject, so that he might work on it along with other research specialists and research assistants in the same laboratory. Sometimes, the personnel of a laboratory was grouped into two or three research teams to work on different subjects respectively. Following were the research activities conducted and being performed by the TSRS []

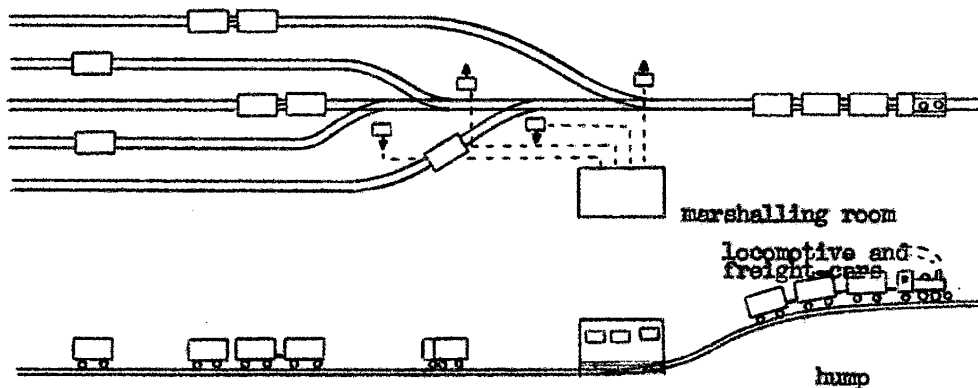
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A. Automation Research: In this field, the TERS had succeeded in electrifying railroad switching system of a hump shunt yard on which the freight cars naturally slid down the slope when released. In the past, shunting of freight-cars to sidings was conducted by locomotives one by one; this required a large amount of time and brought forth considerable mechanical loss. The electric switching system with a hump shunt was first introduced at the P'yongyang Marshalling Yard [] The electric switching system was operated as follows: first, a locomotive pulled a number of freight-cars 50X1-HUM onto the hump shunt, and the freight-cars were released one after another when the switch rails were set for the desirable siding by an electric switching device in the marshalling room. The structure of the hump shunt yard was as follows:



[] the "automatic remote-control brake" system was under 50X1-HUM research by the members working in this field; North Korea intended to introduce this system into the electrified railroad operation in order to make two trains travel in the same direction at a time along a single-track section. To work out this system, the research workers presently concentrated their efforts for invention of an automatic signalling device by which the preceding train could automatically stop the train behind in case the former developed a mechanical trouble.

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- B. Mechanization Research: The research workers in this field had been engaged in producing loading machine, and they finally gained success. The loading machine was installed on the Victory-58 type truck currently being produced in North Korea. [] they also 50X1-HUM succeeded in producing a diesel engine-powered small carrier to carry cargoes and baggages within a railroad station area. The carrier appeared to be similar in shape to a tricycle.
- C. Railroad Maintenance Research: The research workers in this field succeeded in producing "elastic reinforced-concrete tie" [] 50X1-HUM This special tie was designed to produce elasticity to resist violent shocks. [] the workers in this field were engaged in 50X1-HUM studying the cause of the heavy rail abrasion of electrified railroad.
- ✓ D. Chemical Research Field: The research workers in this field were presently engaged in research for the production of "plastic brakes" in order to save iron. The research work on this subject attracted great concern because, when successfully produced, the plastic brakes would have better braking capability than the iron brakes currently used in North Korea.
- E. Rolling Stock Research: The operation of steam-locomotives in North Korea had depended upon imported coal until some years ago. In the recent years, they were operated with anthracite produced in North Korea. Since the combustion rate of anthracite was very low, the research workers in this field concentrated their efforts on the problem how to raise the combustion rate of anthracite. They were currently studying for utilization of a supersonic accelerator to raise the anthracite combustion rate.
- F. Automobile Research: The research workers in this field were studying the methods of economizing on automobile fuel including gasoline and Diesel oil. Like those working in the rolling stock

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research field, the research workers in this field also worked on the introduction of a supersonic accelerator which was believed to enable gasoline and Diesel oil mix with a certain amount of water to burn effectively and easily. This subject was still under research by the workers.

- G. Electrification Research: North Korea so far produced about 30 electric locomotives at the Tasan Electric Appliances Factory. The research workers in this field concentrated their efforts on remodelling the structure of the electric locomotive to fit particular geographical conditions in North Korea. They had so far completed checking efficiencies of the parts of the electric locomotive and were about to start their study on overall efficiency of the electric locomotive, including its hauling capacity. In this final-stage of checking, a dynamometric car was to be used, and they completed designing one, which was being built by the workers of the Wonsan Railroad Factory The dynamometric car was designed to be coupled to the electric locomotive, and the efficiency of the electric locomotive was to be precisely checked by it while in operation. At the same time, the research workers in this field succeeded in utilization of regenerative braking in the operation of electric locomotives. In NK, the braking of electric locomotives had so far been done only by compressed air though they were all equipped with direct current motors which were fit for regenerative braking as they generated power by itself as long as the wheel rolled on while the power of the locomotive was put off. That is, the counter electromotive force obtained from the self-generation of power by the direct current motor could have been used for braking, through which a great quantity of iron consumed for compressed air brake system could be saved. The new device of the electric locomotive was designed to be used generally on the down grade run, while the compressed air braking system was used on the level ground and upgrade.

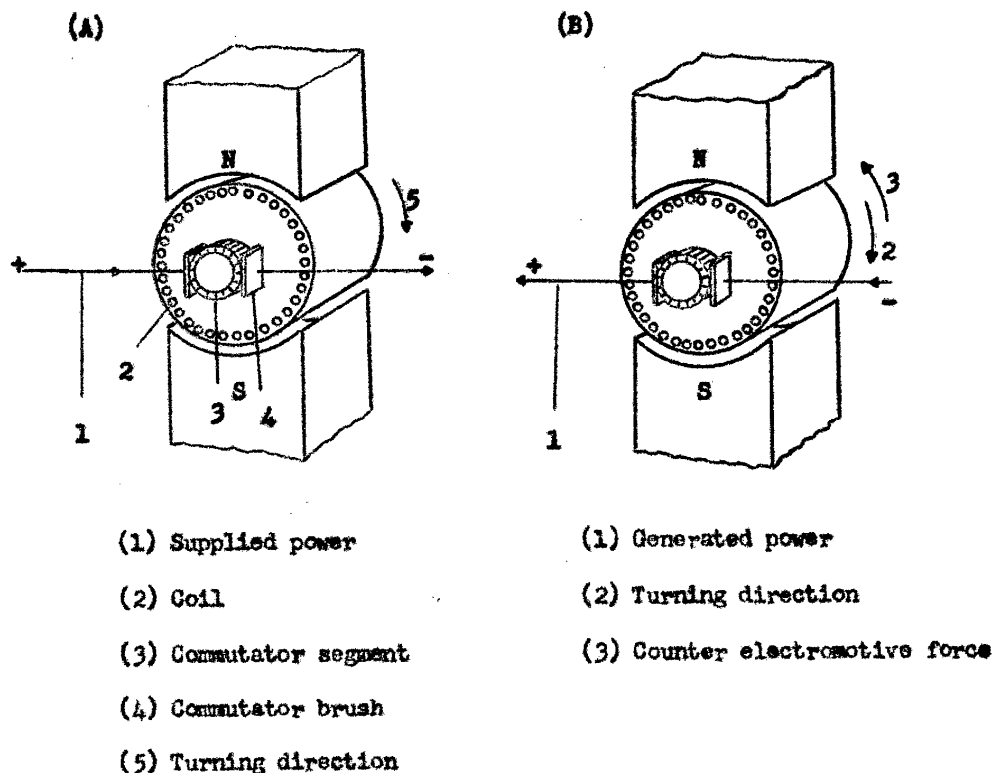
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The following sketch A is the direct current motor of the electric locomotive which functions with supplied electricity, and the B is the same motor functioning as a direct current generator which simultaneously produces counter electromotive force:



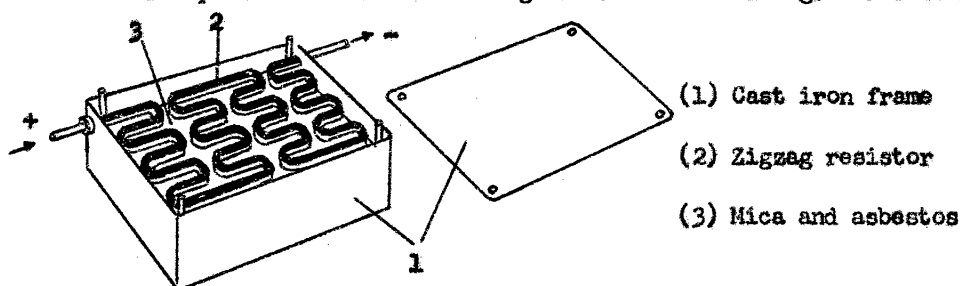
The most difficult problem in this project was how to dispose of the surplus power generated during the process of regenerative braking. To solve this problem, the research workers made three different experiments: At first, they made an experiment to dispose of the surplus electricity by means of sending the power to a nearest transformer station where it could be absorbed by water-resistance. However, it was found that the water-resistance consuming surplus electricity gradually dimmed away as the water temperature rose up, and this method was not effective after all. Next, they attempted to devise a resistor with nichrome wire. This method was found to be successful and efficient, but since the quality and quantity of nichrome wire produced in North Korea was not enough to meet the demand,

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the adoption of this method required an import of nichrome wire from abroad. The second plan was also given up subsequently. Lastly, they attempted to make use of a grid resistor, which could be fixed on the locomotive. This was perfect and successful. The grid resistor was made of zigzag resistance-bars and frames of cast iron, which were insulated by mica and asbestos. To make a resistor about three tons of iron were needed. Upon the final experiment, the grid resistor was adopted for regenerative braking by the Ministry of Transportation. The following is the sketch of a grid resistor:



the research workers in this field was concentrating 50X1-HUM on the manufacture of trolley wire with other metal than copper. Also, North Korea made efforts replacing the conventional mercury-vapor rectifiers by ~~gamm~~ germanium rectifiers, because the mercury-vapor rectifiers were poor in efficiency and very complicated in mechanism. Some years ago North Korean Academy of Sciences succeeded in producing germanium which was regarded to be essential element for electric rectification.

H. Maritime Transportation Research: The research workers in this field continuously carried out research work on the mechanization of loading and unloading in ports, however, they made no remarkable progress. At the same time, the research workers paid a greater efforts on correction of compass deflection for steel vessels on the east coast, and it was said that recently they gained success in their research. Before the research workers gained the success in

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correcting deflection of the mariner's compass, most of navigators on the east coast often caused trouble by a marked compass deflection, particularly in foul weather.

- I. Passenger-coach and Freight-car Research: All the passenger-coaches and freight-cars operated in North Korea so far used lubricating oil soaked in rags which were contained in steel boxes fixed beside the wheels. The steel boxes containing oil-soaked rags were made of steel and mafic metal. The research workers working in this field concentrated their efforts to produce freight-car wheels equipped with roller bearings instead of lubricating oil boxes. The research workers installed an experimental platform with rails for test operation of a freight-car with roller bearing wheels.

Experimental Goods Factory:

5. This factory was headed by a factory chief who was assisted by two instructors. In addition, there were about 17 highly skilled workers including four or five assistant engineers, and they were all grade 6 or higher workers. The workers in this factory were chiefly engaged in manufacturing experimental goods in accordance with designs submitted by various laboratories. The machines installed in this factory were as follows:

Lathes 3 to 4 sets
Shaper 1 set
Abrasive machine 1 set
Fraise 1 set
Drilling machines about 5 sets

This factory also had a blacksmith workshop.

Experimental Process:

6. Once a machine or machine tool was invented or devised by the research workers in accordance with the instruction of the Ministry of Transportation, it had to be perfectly designed by themselves for trial

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production at the Experimental Goods Factory. Test operation of such a machine was generally performed at either a field workshop or a laboratory of this research station. On-the-spot test operation was usually conducted only in case the test operation was impossible otherwise. In most cases, experimental operation and other test were performed at the respective laboratories by the research workers concerned. In case of an experimental operation of a machine, the test was conducted in every aspect to determine its efficiency and to find out possible difference between the theoretical plan and the machine produced. When the experimental operation was found successful, the research workers had to prepare a report on the machine based on scientific and theoretical analysis of the machine as well as its economic significance in the overall national economy. The report was precisely examined by those engineers and skilled workers in the relevant field, and when it passed the examination, the Ministry of Transportation delivered instructions to an appropriate factory to produce the machine.

Materials and Equipment Supply for Experiment:

7. Each laboratory of the research station was equipped with its own experiment room fit for its research work. In case a certain laboratory was ordered to make researches on certain subjects, the laboratory made up plans for researches into the respective subjects as well as specifications of experimental equipment they had and those they needed for fulfillment of the research. Such plans attached with the specifications of equipment were sent to the Materials and Equipment Department of the TSRS by which the appropriate amount of fund was requested to the government. When requesting the fund to the government, the Materials and Equipment Department made up the requisitions for the experimental apparatuses, separately for domestic goods and for imported goods. However, expensive imported items were not so easily available

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in North Korea. Since most of the experimental apparatuses and precision machines to be installed in the respective laboratories in the TSRS had to be imported from abroad, there existed considerable difficulties in getting allotment of foreign currency from the government.

Budget Execution of TSRS:

8. The TSRS summed up the execution of its budget at the end of every year, and the budget of the following year was formed based on that of the previous year. In case particular research subjects were delivered to the TSRS in mid course of a year, the laboratories of the TSRS concerned made up specifications pertaining to length of time, manpower, materials and equipment needed for the research and sent them to the Ministry of Transportation via the Materials and Equipment Department of the TSRS.

Treatment:

9. The personnel working in this research station fell under the following four categories:
- A. Grade 2 Research Specialist: The TSRS had only one grade 2 research specialist, i.e., the Science Deputy Chief. The grade 2 research specialist had to be a holder of the bachelor of engineering degree or the associate professor's title.
 - B. Grade 3 Research Specialist: Those with engineer's qualification who had an experience of five years or more in research work.
 - C. Grade 4 Research Specialist: Those with engineer's qualification who had an experience of less than five years in research work.
 - D. Research Assistant: Those who came under this category were graduates of professional and/or higher technical schools in North Korea, who had assistant engineers' qualification and were considered to be capable of assisting research specialists in their experimental work.

The salaries paid to the personnel of the TSRS were as follows:

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- A. Grade 2 Research Specialist: The monthly pay ranged from 100 to 150 won and they received per capita 800 grams of grain distribution daily at the ratio of 90 percent rice and 10 percent miscellaneous grain. Those who belonged to this grade were qualified as grade 2 central supply recipients.
- B. Grade 3 Research Specialist: The monthly pay ranged from 70 to 100 won and they received per capita 800 grams of grain distribution daily at the ratio of 70 percent rice and 30 percent miscellaneous grain. Those who belonged to this grade were qualified as grade 3 central supply recipients.
- C. Grade 4 Research Specialist: Those who belonged to this category were paid monthly 46 to 70 won and received grain distribution of 800 grams per capita daily at the ratio of 70 percent rice and 30 percent miscellaneous grain, and they were grade 4 central supply recipients.
- D. Research Assistant: Those who belonged to this grade were paid monthly 30 to 50 won.

All of those belonging to the grade 4 or higher were distributed with one suit of summer clothes every year, one winter clothes every two years, and one overcoat every three years. However, the qualities of those clothes distributed varied according to the grades.

Organization and Functions:

10. The following were the organizational structure and functions of administrative offices of the TSRS:

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Chief

- Science Deputy Chief
- Automation Laboratory
- Mechanization Laboratory
- Railroad Structures and Railroads Laboratory
- Chemical Laboratory

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- Rolling Stock Laboratory
- Automobile Laboratory
- Experimental Goods Factory
- Wonsan Branch
- Electrification Laboratory
- Maritime Transportation Laboratory
- Passenger-coach and Freight-car Laboratory
- Administrative Deputy Chief
 - Accounting Department
 - Materials and Equipment Department
 - Bookkeeping Department

Chief: The chief was responsible for overall administration of the research station and for fulfillment of given tasks for ^{researches} ~~maneuvers~~ into transportation science.

Science Deputy Chief: The deputy chief was charged with directing all research activities, and he acted for the chief in case of his absence.

Automation Laboratory: The laboratory was manned by about ten personnel including the laboratory chief, research specialists and research assistants. The research workers of this laboratory were chiefly engaged in researches into automatic operation of railroad signal and other railroad installations in North Korea.

Mechanization Laboratory: This laboratory had about ten research workers including the laboratory chief, research specialists and research assistants. The main task of this laboratory was to conduct researches for mechanization of handling of cargoes and other things within railroad stations.

Railroad Structures and Railroad Laboratory: There were about ten research workers including the laboratory chief, research specialists and research assistants. They were engaged in researches for better utilization

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of railroad facilities and materials and equipment.

Chemical Laboratory: About ten research workers including the laboratory chief were working at the laboratory for development of chemical goods in order to use them in place of railroad supplies made of iron and steel.

Rolling Stock Laboratory: The laboratory was manned by about seven persons including the laboratory chief, research specialists and research assistants. They were mostly engaged in researches for improvement of railroad fuel used by locomotives.

Automobile Laboratory: There were about five research workers including the laboratory chief who conducted researches into automobile oil.

Electrification Laboratory: This laboratory was manned by the laboratory chief, six research specialists and four research assistants. They were engaged in researches to improve efficiency of electric locomotive and to economize on electricity for electrified railroad operations. The experimental room of this laboratory was equipped with the following apparatuses:

Voltmeters and Amperemeters	About 20 varieties
Oscillograph	2 sets
Mercury-vapor rectifier	1 set
Selenium rectifier	1 set
Motor Generator, 20 kilowatts	1 set
Variable resistors	10 each
Single-phased transformer	3 sets
Automatic thermometer	1 set
Resistance-meter	1 set
Power distribution board	1 set

Maritime Transportation Laboratory: A total of five research workers in this laboratory were engaged in researches on port management and navigational affairs.

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Passenger-coach and Freight-car Laboratory: This laboratory had about five research workers including the laboratory chief. They were engaged in researches for improvement of rolling stock haulage.

Administrative Deputy Chief: The deputy chief was responsible for maintenance of the research station and welfare of the personnel of this research station as well as the supply of materials and equipment for research work conducted in this research station.

Accounting Department: This department was manned by two personnel consisting of the department chief and one clerk, who dealt with grain distribution and managed official residences.

Materials and Equipment Department: This department with the department chief and a clerk was in charge of supplying materials and equipment necessary for research work conducted in this research station.

Bookkeeping Department: This department had two persons consisting of the department chief and a clerk. It was in charge of execution of budget as well as payment of salaries and official trip expenses for the personnel working in this research station.

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